# Site Need Statement

| | |
|---|---|
| **General Reference Information** | |
| 1 * | ***Need Title:*** Getter Materials |
| 2 * | ***Need Code:*** RL-WT046-S |
| 3 * | ***Need Summary:*** Fundamental data to improve confidence in the getter material performance under realistic conditions. |
| 4 * | ***Origination Date:*** FY 2000 |
| 5 * | ***Need Type:*** Technology Need |
| 6 | ***Operation Office:*** Office of River Protection (ORP) |
| 7 | ***Geographic Site Name:*** Hanford Site |
| 8 * | ***Project:*** Retrieval, Disposal and Closure PBS No.: RL-TW04, TW09, TW11 |
| 9 * | ***National Priority:***<br>___1. High - Critical to the success of the EM program, and a solution is required to achieve the current planned cost and schedule.<br>_X_2. Medium - Provides substantial benefit to EM program projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays).<br>___3. Low - Provides opportunities for significant, but lower cost savings or risk reduction, may reduce the uncertainty in EM program project success. |
| 10 | ***Operations Office Priority:*** Medium |
| **Problem Description Information** | |
| 11 | *Operations Office Program Description:* The overall purpose of the Retrieve and Transfer SST Waste function is to move the waste from the SSTs into preferred storage in the DST system. A primary objective of this function is to develop and test alternative and improved retrieval technologies to past-practice sluicing. As part of this effort, Leak Detection Monitoring and Mitigation (LDMM) approaches are being developed for concurrent deployment. To support this effort Cold Test Training & Mock-up Facilities are being established. The baseline end state of the Retrieve and Transfer SST Waste function is:<br>• Retrieval of all wastes from the SSTs<br>• The safe, environmentally compliant transfer of this waste to the DSTs<br>• SSTs in a ready state for implementing closure and final disposal of the SST farms.<br><br>The overall purpose of the Disposal function is to provide and operate permitted facilities to disposal of immobilized low-activity waste (ILAW), store and prepare immobilized high-level waste (IHLW) for offsite shipment, and dispose of secondary waste from the tank farms and waste treatment plant (WTP), including failed melters.<br><br>The overall purpose of the Closure function is to close SST and DST tank farms and RPP facilities. Closure of tanks and tank farms assumes that waste retrieval will remove sufficient waste from the tanks that the residual wastes following retrieval, the tanks themselves, the tank farm ancillary equipment, and the contaminated soil will be disposed in place in accordance with applicable regulations and agreements. This strategy also assumes that the residual waste and other tank farm source terms will be considered by the U. S. Nuclear Regulatory Commission to be incidental waste, i.e., non-high-level waste. This function has substantial involvement with studies directed at understanding contaminant migration in the vadose zone and groundwater that are part of the Hanford Groundwater/Vadose Zone (GW/VZ) Integration Project. |
| 12 | ***Need/Problem Description:*** Negatively charged elements and compounds (e.g. $TcO_4^-$, $Se^-$) are poorly sorbed on most materials under basic (pH > 7) conditions. However, some negatively charged materials (e.g. $I^-$) do sorb on Hanford soils under basic conditions. An understanding of how important contaminants interact with the soil will aid the development of appropriate materials to retard the transport of those contaminants. |

| | |
|---|---|
| | If low-cost getter materials can be developed for use in waste disposal, then requirements on waste forms can be reduced, potentially saving hundreds of millions of dollars in the Hanford Immobilized Waste Disposal Program. The Savannah River Site uses FeS to trap technetium, and many disposal sites use concrete to trap uranium.<br><br>This science need supports RL-WT061 Reactive Barriers to Contaminant Migration.<br><br>This need is described in Section 10.3.4 of the Office of River Protection Preliminary Integrated Technology Plan, DOE-ORP-2001-17, Rev 0.<br><br>**Consequences of Not Filling Need:** Conservative methods and data will be used in the performance assessment, likely requiring more stringent contaminant release specifications in the waste product request for proposal and requiring more expensive disposal facilities. More rigorous and expensive retrieval and closure methods may be required to achieve performance requirements.<br><br>** **Program Baseline Summary (PBS) No.:** TW04, TW09, TW11<br>** **Work Breakdown Structure (WBS) No.:** 5.02.01.01.02.02, 5.04.01.03, 5.05.01.01<br>** **TIP No.:** TBD |
| 13 | ***Functional Performance Requirements: :*** In order to meet the contaminant release specifications for the disposal of Hanford low-activity tank waste, radioactive contaminants are physically trapped in glass. However, only a few of these radioactive contaminants drive the performance assessment. If these key radioactive contaminants could be chemically trapped after their release from glass, then the performance of the waste disposal system could be significantly improved. Hydraulic properties of getter materials (original, loaded, and discharged) need to be measured to fully understand waste disposal performance in the presence of getters. The use of getter materials in the Savannah River Site's disposal of the Salt-stone waste was an important consideration in the approval of that site's disposal of tank waste.<br><br>**Outsourcing Potential:** Once the laboratories (PNNL and SNL) have performed the laboratory analysis and bench scale demonstrations, the technology will be available for field scale demonstration and deployment. It is intended that placement of getter materials in contaminated soils or in tank fill materials would be outsourced to private contractors. |
| ** | **Schedule Requirements:** For use during the maintenance phase of Hanford Immobilized Low-Activity Tank Waste Performance Assessments, such data and testing are needed by 2005. For tank closure activities, the data and testing are needed by 2008. |
| 14 | ***Definition of Solution:*** |
| 15 * | ***Targeted Focus Area:*** Tanks Focus Area (TFA) and Subsurface Contaminants Focus Area (SCFA) |
| 16 | ***Potential Benefits:*** |
| 17 * | ***Potential Cost Savings:*** Indeterminate |
| 18 * | ***Potential Cost Savings Narrative:*** The cost savings could be significant. With regard to the disposal facility, the cost savings resulting from lowering the design requirements could exceed several hundred million dollars. The cost saving associated with deployment of the getter material in the soil could approach several hundred million dollars depending on the inventory and distribution of contamination resulting from past and anticipated future leaks. Cost savings associated with deployment of getter materials in tank fill materials could be in the tens to hundreds of millions of dollars if more rigorous tank retrieval requirements or tank closure approaches can be avoided by taking advantage of getter materials in reducing release rate. |
| ** | ***Technical Basis:*** Deployment of sequestering agents could provide an engineering solution for past leaks and retrieval leaks, and for tank fill materials for closure. Deployment of sequestering agents in the matrix or as a liner around the vitrified low-activity waste will reduce the engineering requirements of the disposal facility.<br><br>Concerns regarding the migration of contaminants from existing subsurface contamination, future leaks from sluicing, or residual waste could impact RPP/ORP retrieval options and limit cleanup and disposal strategies. Mitigation of waste immobilization will rely on the principle of chemical stabilization rather than macro-encapsulation or containment. See regulatory concern for the relationship to DOE orders. |
| 19 | ***Cultural/Stakeholder Basis:*** Disposal of low-activity tank waste has the largest impact of any intentional Hanford |

| | |
|---|---|
| | disposal action. Stakeholders and Tribal Nations have voiced opposition to practices that will leak additional contaminants into the soil column. Deployment of the getter material as a reactive barrier will mitigate consequences of contaminants that have leaked to soils, or that may be left in tanks following retrieval. |
| 20 | ***Environment, Safety, and Health Basis:*** Deployment of sequestering agents will reduce the long-term risk to both human health and the environment by attenuating the migration of mobile contaminants. |
| 21 | ***Regulatory Drivers:*** Performance assessments are required by DOE Order 5820.2A, soon to be revised and issued as DOE Order 435.1. |
| 22 * | ***Milestones:*** Data Packages for 2005 ILAW PA (2004); Tank Farm RFI Report (2007); 200 Area RFI reports (through 2008) |
| 23 * | ***Material Streams:*** Sludge, Salt, Liquid (RL-HLW-20) |
| 24 | ***TSD System:*** ILAW disposal facility; closed tank farms |
| 25 | ***Major Contaminants:*** Pu-238, 239, 240, 241; Am-241; U-238; C-14; Ni-59/63; Nb-94; Tc-99; I-129; Cm-242; Sr-90; Cs-137; Sn-126; Se-79; chromium; nitrate; nitrite; complexants (EDTA/HEDTA). |
| 26 | ***Contaminated Media:*** Tank waste consisting of high molarity sodium hydroxide/sodium nitrate solution containing saturated saltcake and/or sludge. |
| 27 | ***Volume/Size of Contaminated Media:*** The single shell tanks are generally 75 ft. in diameter, and up to 40 feet deep with their tops buried about 10 feet below the ground surface. |
| 28 * | ***Earliest Date Required:*** 1/1/2002 |
| 29 * | ***Latest Date Required:*** 12/31/2010 |
| **Baseline Technology Information** | |
| 30 | ***Baseline Technology/Process: Baseline Technology/Process:*** The current strategy for closure of Hanford double and single-shell tanks does not include the use of sequestering agents. Although use of sequestering agents has been proposed for use in support of Environmental Restoration activities on the Hanford site, the technology has not been deployed at Hanford. However, within the scientific community there is considerable interest in its potential use. The need for sequestering agent technology development has been identified in the Immobilized Low Activity Waste (ILAW) program logic<br>**Technology Insertion Point(s):** TBD |
| 31 | ***Life-Cycle Cost Using Baseline:*** |
| 32 | ***Uncertainty on Baseline Life-Cycle Cost:*** |
| 33 | ***Completion Date Using Baseline:*** |
| **Points of Contact (POC)** | |
| 34 | ***Contractor End User POCs:***<br>F.M. (Fred) Mann, CHG, 509-372-9204, F/509-372-9447, Frederick_m_mann@rl.gov |
| 35 | ***DOE End User POCs:***<br>E.J. (Joe) Cruz, DOE-PRD, 509-372-2606, F/509-373-1313, E_J_Cruz@rl.gov<br>P.E. (Phil) LaMont, DOE-ORP, 509-376-6117; F/509-372-1350, philip_e_lamont@rl.gov<br>R.W. (Bob) Lober, DOE-ORP, 509-373-7949; F/509-373-1313; robert_w_lober@rl.gov |
| 36** | ***Other Contacts:***<br>K.A. (Ken) Gasper, CHG, 509-373-1948, F/509-376-1788, Kenneth_A_Ken_Gasper@rl.gov<br>A.F. (Anne-Marie) Choho, NHC, 509-509-372-8280, F/509-373-6382, Anne-Marie_F_Choho@rl.gov |

*Element of a Site Need Statement appearing in IPABS-IS
**Element of a Site Need Statement required by CHG